Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

April 1947

ET-237

United States Department of Agriculture
Agricultural Research Administration
Bureau of Entomology and Plant Quarantine

INSECTICIDE DUSTER

By R. D. Chisholm and L. Koblitsky, Division of Insecticide Investigations, and W. C. Fest and E. D. Burgess, Division of Fruit Insect Investigations[1/]

The operation of dusters to distribute insecticides often depends on compression of air by means of a plunger. In such dusters all the compressed air is conducted into an insecticide container, thereby causing the insecticide to become entrained in the air stream and to be discharged through a vent. Because of the small volume of air compressed during each stroke of the plunger and the low velocity of the entrained insecticide, only a small area can be treated with a single stroke. Therefore, the treatment of a large area is laborious and time-consuming, and agglomerates of partially dispersed insecticide may be deposited. The area of effectiveness may be increased by operating the plunger more rapidly, but this may result in increased deposition of agglomerates. These difficulties were encountered during a study of methods for the distribution of DDT in refrigerator cars as a Japanese beetle quarantine treatment.

The deficiencies of conventional dusters have been substantially eliminated in experimental dusters that have been constructed and used in large-scale tests. In one of the dusters air compressed by means of a plunger is forced into a delivery pipe attached horizontally to the top of an insecticide container. About one-half of the compressed air is diverted from the pipe by means of a scoop and is conducted into the container. The insecticide is entrained in this diverted air stream and then conducted through a connected outlet into the pipe, where it is further dispersed and discharged by the remainder of the air, which has passed by the scoop.

The duster here described is adaptable to specific requirements by establishing the proper relation of the rate of introduction of the air to the diameter of the pipe and to the proportion of the air that is diverted to cause the insecticide to enter the pipe. With experimental models it was possible to increase the area treated with a single stroke of the plunger, to improve

---

1/The authors are indebted to L. B. Parker, of the Division of Fruit Insect Investigations, for the photographs presented in this paper.

the uniformity of distribution, and to reduce the proportion of agglomerates deposited, as compared with those deposited by a conventional hand duster. Best results were obtained when a cylinder of liquefied gas, such as carbon dioxide or Freon-12 (dichlorodifluoromethane), was substituted for the plunger and the pipe was attached to the bottom of the insecticide container to facilitate its charging. Carbon dioxide was found to be well adapted, since it is cheap, readily available, and causes delivery in a matter of seconds of a thoroughly disintegrated insecticide mixture at high velocity throughout a refrigerator car. This duster includes two insecticide containers to provide for delivery into both halves of the car simultaneously.

Description of Duster

The duster adopted for the treatment of refrigerator cars (fig. 1) consists of a trigger-controlled carbon dioxide cylinder (fire extinguisher) (A) with the distributor screwed onto its outlet pipe. The distributor consists of a 1/8-inch (pipe-size) tee (B), into which are screwed two 1/8-inch by 5-inch delivery pipes (C and D) to which 45-degree elbows (E and F) are attached. Insecticide containers (G and H) are soldered onto the tops of C and D, respectively.

The construction of insecticide container H is shown diagrammatically in figure 2. It is assembled by soldering a 1-inch pipe cap (I) onto delivery pipe D and drilling a 3/16-inch and a 1/4-inch outlet hole (J) through both. A gas-inlet tube (K), made from a piece of 3/16-inch (o.d.) by 3 1/2-inch tubing, is soldered into the 3/16-inch hole. A longitudinal section 7/16 inch long is removed from the lower end of the tube and the remaining section is shaped to form the scoop, which is placed so that its concave surface faces into the stream of gas and occupies about half of the cross-section area of the pipe. A 1-inch by 3-inch nipple (L) is screwed into pipe cap I and closed by a 1-inch pipe cap (M). The insecticide container is charged with cap M removed and is ready for use when the cap has been screwed firmly in place. Container G is a mirror image of H.

Operation of the Duster

For the treatment of refrigerator cars, the duster is placed either near the door on the floor or on top of the load, with pipes C and D parallel to the long axis of the car and elbows E and F pointed toward the opposite side of the car at its intersection with the ceiling. The insecticide is discharged on release of carbon dioxide by compressing the trigger for about 1 second. Another very short release insures complete discharge of the insecticide and provides additional turbulence within the car.

This duster provides a simple and rapid method for the distribution of insecticides. In two tests 1 ounce of 10-percent DDT dust was distributed in refrigerator cars loaded with potatoes. The deposits on seven glass plates located on top of the loads ranged from 3.6 to 5.8 and from 3.5 to 4.5 micrograms of DDT per square centimeter, and averaged 4.7 and 4.1 micrograms, respectively. In two other tests, in which 1/2-ounce doses were used, the ranges per square centimeter were from 2.6 to 3.1 and from 1.8 to 2.4, and the averages 2.9 and 2.1 micrograms, respectively. In all tests the quantity of agglomerates deposited was negligible.

Adaptation to Use with Liquids

Preliminary trials have indicated that the duster may also be used for distributing liquid insecticides as finely atomized sprays if the elbows are held in position and the delivery pipes are rotated one-half turn, so that the insecticide containers extend vertically downward. The following adaptations may be made: Gas-inlet tube K may be shortened so as to include the scoop and enough tube to pass through pipe cap I. A tube almost as long as the inside length of the insecticide container may be fitted into outlet hole J. Delivery pipes C and D may be shortened. The insecticide container is filled with a liquid by unscrewing the nipple L, with the pipe cap M in place, at its junction with the pipe cap I. It is ready for use when the nipple is screwed tightly into the pipe cap.

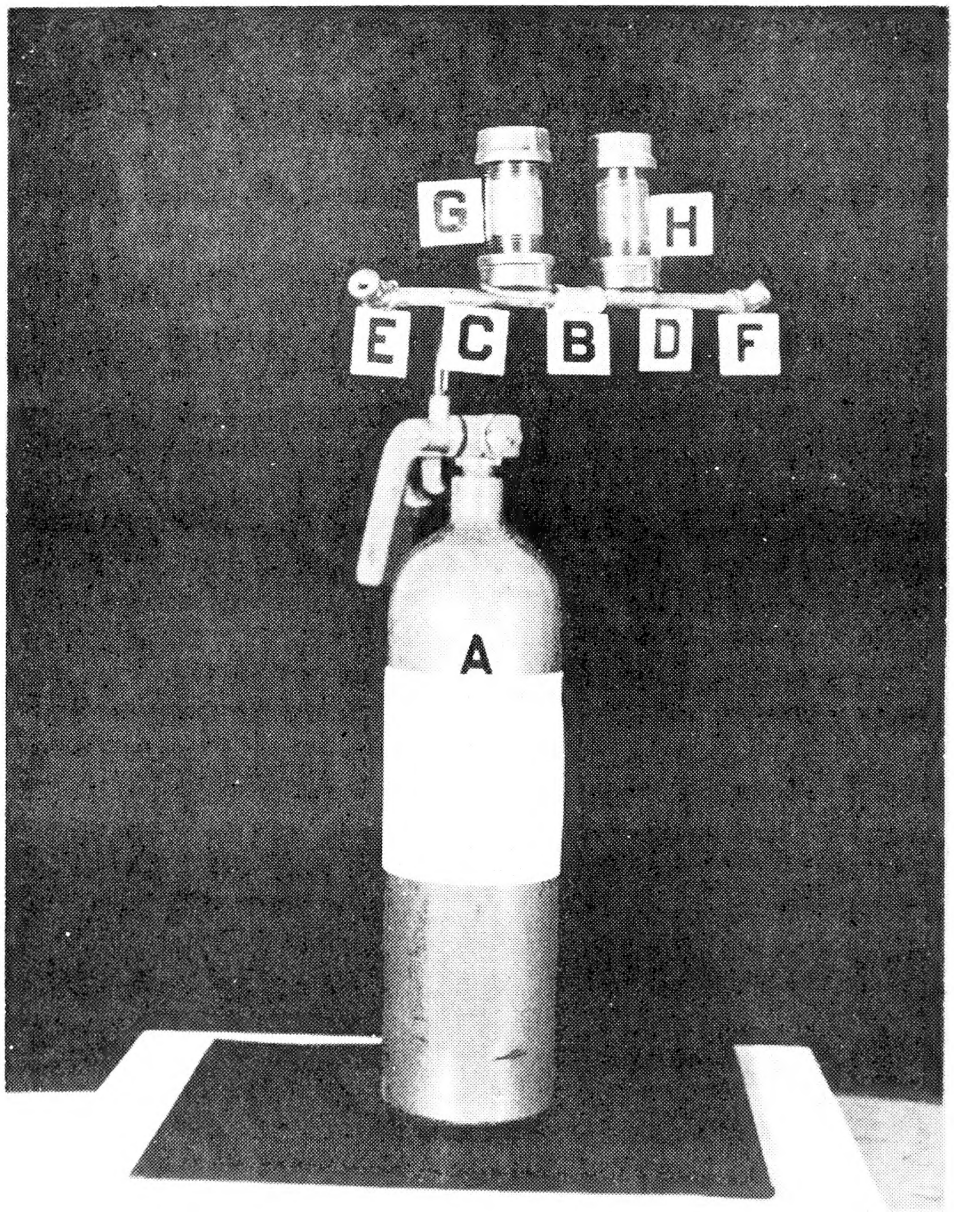

Figure 1.--Assembled insecticide duster.

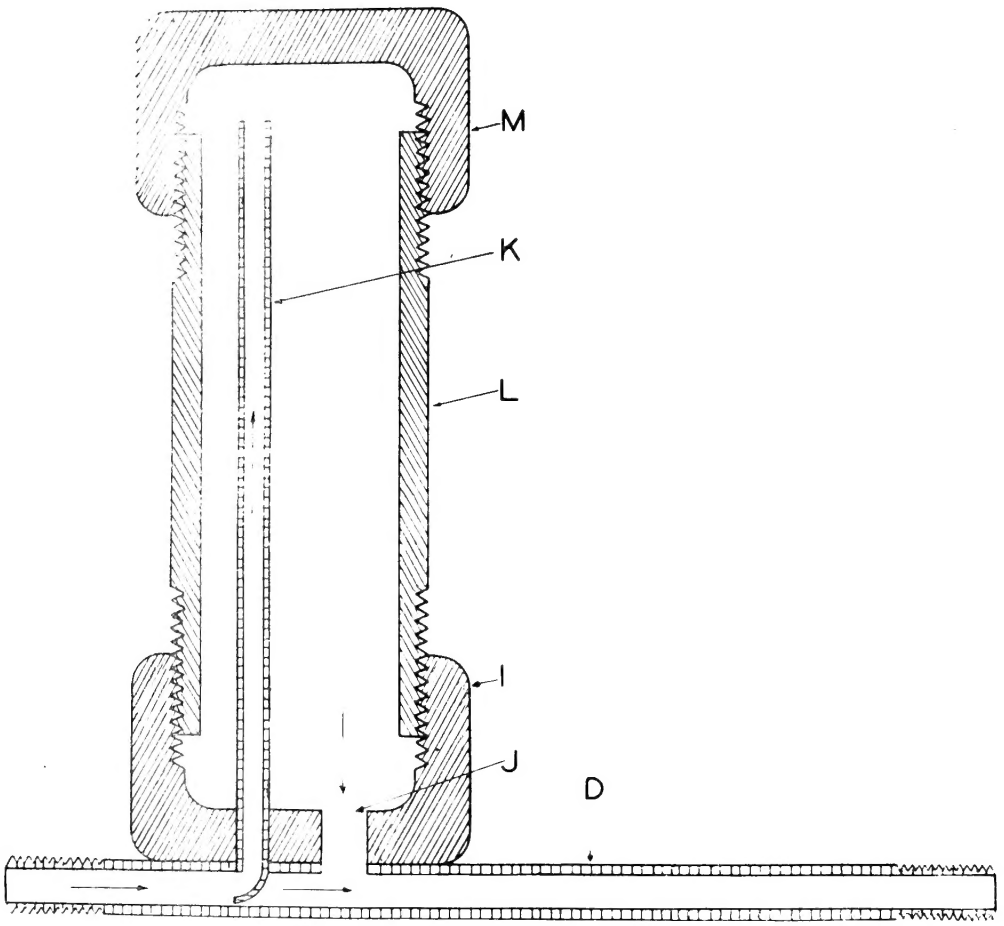

Figure 2.--Diagrammatic view of insecticide container assembly (H).

(Directions of gas streams shown by arrows.)